

THE CLOUD CHAMBER

Three important forms of ionizing radiation are alpha and beta particles and gamma rays. Alpha particles are identical to the nucleus of a helium atom. They have a double positive charge (two protons) and are relatively large. Beta particles are much smaller. They carry a single negative charge (one electron). Gamma rays have no mass or charge.

Ionizing radiation cannot be detected using our senses. However, a cloud chamber allows you to see the tracks it leaves in a dense gas. When charged particles pass through the chamber, they leave a track much like the vapor trail of a jet plane.

PURPOSE:

What is the purpose of this activity?

(The purpose of this activity is to make indirect observations of radiation.)

HYPOTHESIS:

Directions: Draw a picture of what you expect the radiation tracks to look like. Remember that there are three types of radiation: alpha and beta particles and gamma rays.

(Drawings will vary.)

MATERIALS:

small transparent container with transparent, tight-fitting lid (such as refrigerator jar or cloud chamber purchased from scientific supply company)

flat black spray paint

blotter paper (one strip about 5 centimeters [2 inches] wide and long enough to fit around the inside of the jar)

cotton or silk cloth

ethyl alcohol

source (uranium ore, numeral from a luminous dial, purchased source, etc.)

masking tape

"dry ice"

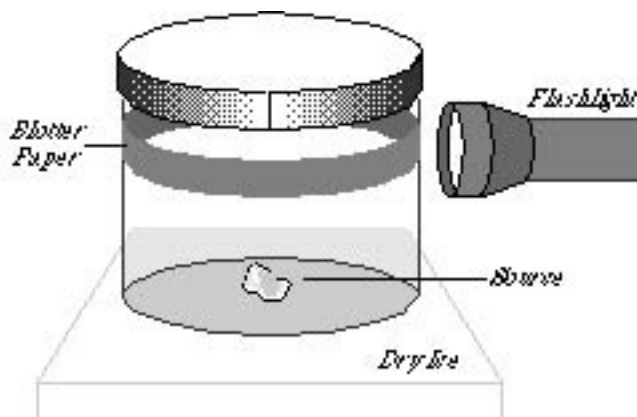
tongs or gloves for handling dry ice

flashlight

CAUTION: DO NOT HANDLE DRY ICE WITH YOUR BARE HANDS. USE TONGS OR GLOVES.

PROCEDURE:

1. Paint the bottom of the jar with the black paint. Allow the paint to dry.
2. Attach the blotter paper to the inside of the jar near the top. You may need to tape it.
3. Pour a very thin layer of ethyl alcohol on the bottom of the jar.
4. Soak the blotting paper ring with alcohol.
5. Place the radiation source on the bottom of the jar and put the lid on tightly. Tape around the lid.
6. Place the jar on top of the dry ice.
7. Allow the jar to super cool for 5 minutes.
8. Darken the room and shine the flashlight through the side of the jar. Through the top, you should see white lines or "tracks" inside the jar close to the bottom.
9. You may be able to find three kinds of tracks:
 - a. Most of the tracks will be about 1.3 centimeters (0.5 inch) long and quite sharp. These are made by alpha radiation.
 - b. Sometimes you will see longer, thinner tracks. These are made by beta radiation.
 - c. Occasionally, you may see some twisting, circling tracks that are so faint that they are difficult to see. These are caused by gamma radiation.



OBSERVATIONS:

Directions: Draw and label pictures of what you see in the cloud chamber.

CONCLUSION:

1. Were you able to observe radiation directly or indirectly in the cloud chamber?

(Radiation can only be observed indirectly.)

2. Write a concluding statement explaining how we know radiation exists.

(We know that radiation exists through indirect observations like using Geiger counters, radiographs, or in cloud chambers.)
